REMARKS

The amendments of claims 1 and 7, citing less than 300° C, is supported in the specification on page 8, lines 24 – 25. The amendment for claim 5 is supported in the specification on page 4, lines 3, as a known upper temperature where there is decrepitation.

Claims 1-6 and 9 stand rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Villarreal-Trevino et. al., US patent publication 6,395,056 in view of Lotosh, et al., US patent publication 4,049,435. With respect to amended claim 1: Villarreal-Trevino et. al. disclose a pretreatment process for solid iron ore lump feed material to be directly reduced in a gas and pellet/lump-based moving bed shaft (abstract, col. 2 lines 48-67). Villarreal-Trevino et. al. state that their process is applicable for lumps of iron ore, pellets, sinter or otherwise agglomerated iron oxides (col. 2, line 66- col. 3, line 2), which is broad enough to encompass "sedimentary iron ore". One process option disclosed in Villarreal-Trevino et. al. includes pre-heating the lump feed to above 600 °C prior to processing in the reduction furnace (claim 1), thus it is implicit that the Villarreal-Trevino et. al. process will result in "increasing the thermal profile of the furnace" and result in a smaller "zone of low-temperature reduction." Villarreal-Trevino et. al. disclose that the purpose of pre-treatment in non-reducing conditions is to strengthen the ore, thereby decreasing the formation of fines in the reduction reactor (abstract and col. 2, lines 13-16). Villarreal-Trevino et. al. indicate that their invention is concerned with preserving the strength of "iron ore lumps or pellets" (col. 1, lines 59-61). Villarreai-Trevino et. al. indicate that while their invention is described as applied to

lumps of iron ore, it is also applicable to pellets, sinter or otherwise agglomerated iron oxides (col. 2, line 66- col. 3, line 2), indicating that for purposes of their invention, the pellet and lump iron ore feed materials are interchangeable. The Examiner admits that Villarreal-Trevino et. al. do not prescribe a time for stockpiling the ore, or disclose the moisture content of pretreated ore. Lotosh et. al. disclose a "method for obtaining a lump product" which includes pretreatment of iron ore pellets to achieve strengthening prior to use in a process. In the discussion of their invention, Lotosh et. al. disclose a preliminary aging treatment which "can be effected in floor-type storehouses" in atmospheric conditions, for a predetermined time (col. 5, lines 1-8) for strengthening pellets. The preliminary aging treatment effected in floor-type storehouse disclosed is equivalent to the claimed "stockpile." Since the use of pellets and lump iron ore is interchangeable in the Villarreal-Trevino et. al. invention, it would have been obvious to one of ordinary skill in art at the time the invention was made to stockpile the lump ore or pellets for a predetermined time for strengthening as disclosed by Lotosh et. al. (col. 5, lines 1-8), prior to use in the method disclosed by Villarreal-Trevino et. al. Lotosh et al. disclose as part of their invention a drying process that reduces the water content of lump ore to between 0.01 and 1% free moisture content (col. 5, lines 37-44), which overlaps the claimed range of less than 0.5% by weight. It would have been obvious to one or ordinary skill in the art at the time the invention was made to dry the lump ore to a water content of less than about 0.5% in the Villarreal-Trevino et. al. pretreatment process, since Lotosh teaches that the entire range between 0.01% and 1% water is beneficial for strengthening (claim 1).

Applicant has amended claim 1 to include the limitation that the pre-drying step be

conducted at a temperature less than 300° C. Villarreal-Trevino et al. teach in col. 3 line 20 that the temperature of the particles exiting the preheating device are 700° C. Villarreal-Trevino et al., Claims 1 and 2, claims that the temperature of the particles exiting the preheating device are above 600 ° C. The Applicants' temperature limitation overcomes Villarreal-Trevino et al. Furthermore, Lotosh reads on lumps, which are pellets and briquettes, col. 1 lines 1-4, held together with a binder. Applicants are claiming iron ore lumps, which is crushed material not a compressed material. Lotosh teaches a first and second stage of drying using high humidity and temperatures as 900° C (col. 3, lines 1-5). Lotosh teaches in col. 5 lines that "The heat humidity treatment is effected in an atmosphere with a relative humidity of 70-100%, which prevents evaporation of water from the lumps." Applicants process is drying the material, not hydrating cement, as is the case with Lotosh. Lotosh, col. 5 lines 6 – 7, teaches preliminary aging for a period of time when " the cement binder has begun to set." Applicants claim storing iron ore material to relieve internal stress (induced during mining the iron ore). Applicants overcome Lotosh because of the following reasons:

a) In Lotosh, storage is in floor-type warehouses as iron material pellets containing cement, for a period of time until the cement starts to harden.

b) In the instant invention, Applicants storage of lump iron ore is in stockpiles exposed to an open atmosphere to relieve internal stress (induced during mining the iron ore).

c) In Lotosh, pre-drying is in multiple stages under high humidity to hydrate the cement, reaching temperatures far exceeding 300° C (the upper limit claimed by Applicants).

d) In the instant invention, Applicants pre-dry the iron ore lumps in a step, with no constraints

on humidity.

In light of the amendment and the remarks, Applicants believe that they have overcome the rejection based on Villarreal-Trevino et. al. in view of Lotosh et al, and claim 1 should now be allowable.

Examiner states, that with respect to claim 2, Lotosh et. al., provide an example for implementation of the invention based on prior art wherein a 28 day aging process is required (col. 4, lines 26-35). It would have been obvious to one of ordinary skill in the art at the time the invention was made to age pellets for at least one month prior to use in the Villarreal-Trevino et al. invention, where this duration is beneficial to achieve higher compressive strengths as disclosed in Lotosh et. al. (col.4, lines 29-35).

Applicants claim in claim 2 a period of time of at least 1 month, which falls outside the scope of every month but February, and Lotosh (col. 4, lines 26-35) is reading on a pellet with a binder, not a lump of iron ore.

Examiner admits, that with respect to claim 3, Lotosh et al., disclose a two stage drying process, but argues that both of which overlap the claimed drying temperature of about 200 °C. It would have been obvious to one of ordinary skill in the art at the time the invention was made to dry lump ore or pellets in the Villarreal-Trevino et al. process at a temperature of about 200° C to obtain a strengthened ore product as disclosed by Lotosh et. al. {claim 1).

Applicants agree that both steps overlap the claimed drying temperature of about 200° C, however, Lotosh teaches that he is not trying to dry the pellet, but to hydrate the cement, and that is why he employs a process that has 70% – 100% humidity (col. 5 lines 9 – 14). Applicants are drying a lump of iron ore, not hardening a pellet with cement.

Examiner states, that with respect to claims 4 and 5, Villarreal-Trevino et al. disclose a process wherein pre-heating is performed in a feed storage bin which is heated by waste off-gases at a sufficient temperature to heat the feed material in the storage bin to a temperature within the range of 75° C to 1,100° C (col. 3, lines 31-49 and Figure 5). The temperature of the waste off-gas is not explicitly stated, however it is sufficient to heat the solids to within 75 °C to 1,100 °C, which overlaps the claimed range of "in excess of 300 °C". It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize hot off-gases above 300 °C as claimed by applicant for pre-drying solids in the Villarreal-Trevino et al. process, in order to heat solids to a temperature of above about 600 °C as disclosed by Villarreal-Trevino et al. (claim 1).

Applicants argue that the cited temperature range of 75° C to 1,100° C (col. 3, lines 31-49 of Villarreal-Trevino et al.) are a typographical error. The actual range taught by Villarreal-Trevino et al. is 750° C to 1,100° C. The Applicants contend that the temperature range of 75° C to 1100° C (see col. 3 lines 36-36) is internally inconsistent with the rest of the patent, and that the actual range is 750° C to 1100° C, and that the lower temperature range of 75° C is a typographical

error. Support for the contention can be found in col. 2 line 51, which teaches a range of 750° C to 1100° C. Claim 4 claims a preheating temperature range of 700° C to 800° C. Villarreal-Trevino et al. teach in col. 3 line 20 that the temperature of the particles exiting the preheating device are 700 ° C. Applicants assert that it is self evident that the particles could not attain this temperature if the pre-heating oven is only 75 ° C. Further support that the lower temperature range is actually 750° C, **not** 75° C, can be found in Villarreal-Trevino et al., Claims 1 and 2, wherein the temperature of the particles exiting the preheating device are above 600 ° C. Therefore, with respect to claim 4 and currently amended claim 5, the waste gases would be too hot for the feed material storage bin, as the temperature causes decrepitation. The rejections are respectfully overcome.

Examiner states that with respect to original claim 6, Villarreal-Trevino et al. teach a process option (see Figure 5 below), which includes a reformer (69) to produce the reducing gas (col. 4, lines 12-34). The reducing gas is fed to the furnace (30), then waste off-gases are removed from and cooled in a heat exchanger (44), then either returned to the reformer, treated in another manner, or combusted as part of the fuel for the pretreatment system (Figure 5). The applicant's use of the phrase "associated with" is interpreted to mean anywhere in the system as opposed to directly connected to.

Applicants are claiming in claim 6 waste off-gases removed from a reformer. Applicants

were unable to find a path that illustrates that waste gases removed from the reformer (69) that go anywhere but back to the furnace in Figure 5. The Examiner appears to be in error, Villarreal-Trevino et al. do not teach the claimed process, and the rejection is respectfully traversed.

Claim 9 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Villarreal-Trevino et al. in view of Lotosh et. al, as applied to claim 1 above, and further in view of Baum, US patent publication 3,941,582.

Applicants' currently amended claim 9 is a dependent claim depending from claim 1, and has all the limitation of the parent claim. Claim 9 derives its novelty from claim 1.

Claims 7 and 8 and 10 stand rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Villarreal-Trevino et al. in view of Beggs et, al., US patent 3,764,123. Villarreal-Trevino et al. disclose an apparatus for preheating feed material to a direct reduction shaft furnace, see figure 5 above. Villarreai-Trevino et al. disclose a moving bed reactor (col.2 lines 48-51) which is equivalent to the claimed "shaft furnace" having an "upper feeding and heating portion" (12), a "middle gas feeding and reducing portion" (32), "and a lower product discharge portion" (34 and 50). Means is provided "for removing hot gas from the furnace" (42), and for "reforming removed off-gas" (69). A "feed material storage bin" (12) is provided, with means for "removing waste off-gas communicating with said storage bin for heating the contents thereof (24) and "means of transporting the heated feed material to the furnace and for charging the heated feed material into the shaft furnace

for reduction" (26); the feed material storage bin is depicted as a hopper (12; col. 4, lines 23-24). Viliarreal-Trevino et al. do not specifically teach a means for heating the reformer by the combustion of gas, but this feature is conventional as evidenced by Beggs, et.al., Figure 1 below, which discloses a reformer (38) for reforming removed off-gas from a vertical shaft furnace, including a means for heating the reformer by combustion of gas (fuel fired burners, 40), and means for removing waste combusted off-gas from reformer (flue pipe, 42). Therefore, it would have been obvious for one of ordinary skill in the art to incorporate the gas fired combustion heated reformer of Beggs et al. into the process of Villarreal-Trevino et a!, to produce a hot reducing gas with a controlled high reductant content relative to oxidant content as disclosed by Beggs et al.

Applicants have amended claim 7, including the limitation that storage bin operates so that its contents are dried at a temperature less than 300° C. This temperature falls outside the range of Villarreai-Trevino et al. Furthermore, Beggs et al. teaches that the gases used to heat the reformer are either recycled as spent DRI gases (69 and 70 through 71) or are exhausted (through 42). Beggs et al. does not teach that the gases are used to pre-dry lump iron ore. The rejection is respectfully overcome.

Claim 8 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Villarreai-Trevino et al. in view of Beggs et al., as applied to claim 7 above, and further in view of Becerra-Novoa et al, US patent 5,445,363.

Applicants' claim 8 is a dependent claim depending from claim 7, and has all the limitation of the parent claim. Claim 8 derives its novelty from claim 7.

With respect to claim 10, Examiner states that Villarreal-Trevino et al. (Figure 5, and col.4 line 20 to column 6 line 16) disclose a heat exchanger (44) and combustion chamber (16) between the means for recovering waste combusted off gas (42) and the feed material storage bin (12). Both the heat exchanger and the combustion chamber provide means for adjusting the temperature of the off-gas.

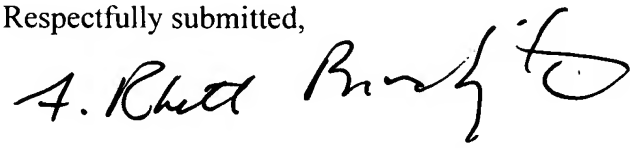
Applicants' claim 10 is a dependent claim depending from claim 8 and independent claim 7, and has all the limitation of the parent claim. Claim 10 derives its novelty from claim 7. Furthermore, none of the cited references teach pre-drying lump iron ore in a storage bin.

Applicants have canceled claims 6 and 7, in US application 10/789,696, titled PRE-TREATMENT PROCESS FOR FEED MATERIAL FOR DIRECT REDUCTION PROCESS, and the issue of double patenting is resolved, as the claims of the instant application read on an apparatus, and the claims of 10/789,696 are process claims. The two applications have a common assignee.

Since the amendment to the claims does not add more claims than previously paid for, no additional fee is required for the claims. A Petition with payment for a 3 month extension of time, and a request for continued examination with payment is enclosed.

In view of the foregoing amendment and these remarks, this application is now believed to be in condition for allowance and such favorable action is respectfully requested on behalf of applicants.

Respectfully submitted,



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